DOCUMENT RESUME

ED 217 550 EA 014 680

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TITLE Curriculum Management Systems: Analysis and Definition.
PUB DATE Mar 82
NOTE 35p.; Paper presented at the Annual Meeting of the American Educational Research Association (New York, NY, March 19-23, 1982).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Curriculum Development; *Management Systems; Models; Needs Assessment
IDENTIFIERS *Curriculum Management

ABSTRACT

Using a computer-assisted search of the literature, the author sought to identify and analyze documents concerning curriculum management systems for the purpose of developing a general description of a comprehensive curriculum management system model. The 12 documents identified in the search included definitional works and descriptions of operational models. The purposes of curriculum management systems discussed in the literature included decision-making, curriculum development and planning, and materials development. Among the characteristics determined to be essential to a comprehensive curriculum management system were that it be (1) non-specific as to curriculum; (2) ongoing; (3) applicable at various levels of the educational hierarchy, yet non-hierarchical in itself; (4) nonlinear and internally interactive; (5) stochastic in behavior; and (6) possessed of at least four operational components: needs assessment, planning and development, implementation, and evaluation. (Author/PGD)

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# Curriculum Management Systems: Analysis and Definition

by

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Paper presented at the annual American Educational Research Association convention

New York, March 1982

# Curriculum Management Systems: Analysis and Definition[1]

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In a time of decreasing operational budgets and diversified demand on educational institutions, the management function of administration becomes a more crucial factor in any educational equation. One particular aspect of educational management which will become more critical will be the management of curriculum and curricular activities. The diversity of the student population with its attendent interests in a wide range of curricular offerings is one major factor influencing curricular decisions. The increasing age range of students as well as their background experiences demand careful attention to the needs of these various age groups. Further, the adult learner is often a full-time worker and may live at a great distance from a particular institution. Finally, the advent of newer, ever changing technologies for instructional delivery of curriculum places the educational manager in the position of deciding what delivery system suits which portion of the curriculum. These concerns prompted the present investigation of curriculum management systems.

## What is a Curriculum Management System?

The purpose of this inquiry is to answer, in a preliminary way, the question, "What is a curriculum management system?" During this inquiry certain a priori definitions or assumptions will be made. These assumptions are made because the inquiry is not intended to answer or to review definitions of curriculum, the use of the systems approach in educational management, or the various modalities of systems analysis. Rather, the purpose here is (1) to identify that literature which concerns itself with curriculum mangement systems and (2) to analyze that literature in an attempt to obtain a coherent definition of "curriculum management system." The intent of definition will be to describe a comprehensive curriculum management system model.

## Method

In order to obtain an answer to the question "What is a curriculum management system?" (hereafter CMS), a comprehensive literature search was conducted. The literature search was

computer-assisted using the BRS data base system and supplemented by a manual search. The BRS data base has numerous individual data bases. A preliminary search to obtain the number of potential articles in each was conducted. The author's experience with computer-assisted literature searches indicated that a broad-based approach yields more information. Thus, a broad-based search of all individual data bases was conducted using the key words "curriculum," "management," and "system." After each search of an individual data base was completed, all citations, including abstracts, were printed. Each abstract was examined to determine if the citation actually contained any information on CMS. Generally, an article was considered relevant if the abstract indicated that the citation contained information which was descriptive of a systematic approach to managing curriculum. After conducting the supplemental search, the final body of literature for this study had been identified and was then subjected to the following analysis.

Analysis Procedure

A systems approach (Sutherland, 1975) was taken to analyze the literature. Specifically, each literature piece was examined to obtain the following information.

1. The purpose of the CMS.
2. The users of the CMS.
3. The number of elements or components of the CMS.
4. The type of elements or components of the CMS.
5. The structure of the CMS.

This information was then used to establish the following properties of the CMS.

1. Interface conditions (system relationships).
2. Dynamic properties of the system.
3. Structural characteristics of the system.

The approach of this analysis is derivative of Kaufman (1970) and Hoether (1971), and can be called the descriptive mode of systems analysis. This is a subset of a generalized systems approach, or design process mode, which Kaufman described in the following six steps (paraphrased).

1. Description of the current system.

2. Determination of the ideal system state.

3. Identification of alternative strategies to get from current state to ideal state and choosing a strategy to do so.

4. Implementation of selected strategy.

5. Evaluation of success of strategy.

6. Revision of model through above process, as often as needed.

This present analysis includes steps 1 and 2 above. Kaufman called this subset problem identification, verification, and validation.

## Results

The literature search yielded meager results. Twelve (12) literature citations were found which related to the topic under consideration. Several of the included pieces of literature are only tangentially related and are presented as examples of other citations which were discarded but which had minor relationships to curriculum management systems. (In determining which citations were relevant, the assumption was made that curriculum and instruction, or curriculum management system (CMS) and instructional management system (IMS) represented opposite ends of a continuum. Thus, the point of inclusion for a citation was closer to the CMS rather than the IMS end of the continuum.)

The citations were grouped initially based on the type of article, i.e. the approach the article took to CMS. Two (2) of the citations were definitional. Two (2) of the citations proposed a CMS model. Five (5) presented proposed operational CMS models. Three (3) citations were closer to an IMS than a CMS. The results of the analysis will be presented using the above catagories.

### Definitional Citations

Henderson (1973) defined curriculum management system as systematic decision-making. Further, Henderson suggested that the users of a CMS are the administration and the instructor. Components of the CMS included an advisory council, topics or subjects, instructional method, and instructional materials. The ultimate purpose of the CMS was classroom use.

Beauchamp and Beauchamp (1972, p. 4-5) stated that a curriculum system was a "system for decision-making and action with respect to curriculum functions which are regarded as part of the

total operations of schooling." They identified three components of a CMS which were (1) input data, (2) content and processes for maintenance of the system, and (3) output or outcomes of the system. The input data are "those sources of ideas and authority for curriculum decision-making." (p. 5) The outputs are "the results of the functioning of the system." (p. 6) The content and processes are analogous to what they have called curriculum engineering or "those processes necessary to make a curriculum system function." (p. 6) These process elements are planning, operations, implementation, and evaluation.

Proposed Models

Gottesman (1976) proposed a system approach to curriculum planning. The components of the system were (1) needs assessment, (2) philosophy, (3) goal setting, (4) general and specific objectives, (5) instructional program, and (6) evaluation. The three elements which influence the system were the learner, the society, and organized knowledge. The dynamic qualities and the structure of this system are presented in Figure 1.

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Insert Figure 1 about here.

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Feyereisen et al. (1970) presented a complex CMS model. The CMS was viewed as a "decision-making subsystem to a total administrative system which is responsible for the identification and solution of those problems found in the curriculum and instruction system." (pp. 57-58) This decision-making CMS included eleven (11) elements.

1. Problem identification.
2. Problem diagnosis.
3. Alternative solution search.
4. Best solution selection.
5. Solution ratification by organization.
6. Solution authorization.
7. Trial use of solution.

8. Preparation of solution adoption.

9. Solution adoption.

10. Staff direction and guidance.

11. Evaluation of solution effectiveness.

The CMS model was proposed for a public school system and proposes a hierarchical layer of subsystems within the CMS. Each layer represented a different user, i.e. central administration, elementary school administration, secondary administration, individual schools, etc. Inputs from various constituents occurred at the problem identification level. The system contained multiple feedback loops. The general system structure is presented in Figure 2.

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Insert Figure 2 about here.

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Tangential Citations

The following citations are presented because of the borderline nature of their relationship to this research. Each of the following citations is representative of citations which were eliminated.

Gebhart and Peter (1977) describe what they have identified as a CMS. This CMS was intended to oversee the implementation of a teacher training program using performance-based teacher education modules. However, the CMS identified has no particular structural or dynamic qualities. Rather, the CMS is a statement of resources and activities engaged in by teacher training students. The components of this CMS were (1) library reading lists, (2) audio-visual materials list, (3) seminars, (4) on-site supervision, and (5) a check off system for performance evaluation of the students.

Royal (1975) presented a management system of a high school academic department. The components of this management system were as follows:

1. Problem identification.

2. Goal statement.

3. Performance objective writing.

4. Strategy development to accomplish objectives.

5. Take action.

6. Systematic follow-up

7. Evaluation/reiteration.

This system allows for continuous flow through the seven components, but based on descriptions, this system appears to be more closely aligned to an instructional system design/development model than to a CMS.

Proger (1977) describes the computer-assisted SER-LARS (Special Education Resources Location Analysis and Retrieval System) curriculum management system. The system consists of three general components: behavioral objectives, curriculum materials, and a criterion-referenced measurement system. The specific elements of the system include (1) learning objectives, (2) tests, (3) learning environments, (4) instructional materials, (5) instructional methods, (6) human resources, and (7) students. The system structure was identified as a standard diagnostic-prescriptive model with eight levels of operation. These levels were

1. Describe student.

2. Pretest skills levels.

3. Diagnose content deficiencies.

4. Diagnose process and learning style problem.

5. Identify learning objectives and administer objectives-referenced tests.

6. Write instructional prescription.

7. Implement and monitor prescription.

8. Posttest skill level.

Proger compares the SER-LARS system to other systems including the Palo Alto Reading Program CMS, the Commonwealth Plan to Educate and Train Mentally Retarded Children (COMPET) CMS, and the Training for Independence (TFI) CMS.

While each system is identified by Proger as a CMS, the intent of each system is instruction, using an objectives-banking process as the basis for management. Thus, these systems appear to be more closely related to instructional management systems than to curriculum management systems.

Proposed Operational Models

Valentine and Larson (1977) present a CMS model used for curriculum development purposes. The model has three components: planning, implementation, and evaluation. The results of the operation of the model depend primarily on the needs assessment nature of diagnosing needs of the learner. The structure of the system is presented in Figure 3.

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Insert Figure 3 about here.

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The CMS of project HIRE is covered by Gardner and Beatty (1979). The purpose of the CMS is the development of curriculum materials for the handicapped. They have described this CMS as both a standards/strategies model and a product development model. The general structure of the system is presented in Figure 4. The model is based on a management by objectives approach with standards being the equivalent of objectives. The CMS is presented with individual schools as the users of the system while system management is accomplished by a university-based coordinating staff responsible for planning and evaluation, design and implementation of the use of curriculum materials, data analysis of evaluation results, and final product writing of the product.

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Insert Figure 4 about here.

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The most extensive CMS encountered was the statewide CMS for Georgia vocational programs as described in Scott and Moye (1979) and in Scott et al. (1979). This is a multilevel system for the development and implementation of vocational education curricula.

Scott and Moye (1979) describe the curriculum management functions and tasks of the local vocational education administrator. These functions are rough approximations of the components of the local CMS. They are (1) program design and implementation, (2) selection and organization of vocational education content, training, and materials, (3) coordination of human resources for curriculum and instructional purposes, and (4) evaluation of curriculum planning and improvemen..

Elements of the local CMS are philosophy, delivery system, planning format, implementation strategy, materials development, model articulation, individualized instruction, and classroom management. There is no description of the structure of the local CMS because this is left to the discretion of the local administrator.

The state level CMS is the subject of Scott et al. (1979). The structure of the model is detailed in Figure 5. Table 1 lists the system components and the elements for each component. Figure 5 also indicates, via arrows, the general flow of the model. The functions of the Georgia CMS are defined as management, development, materials reproduction, materials diffusion/dissemination, and materials evaluation and revision. This model is essentially a method of articulation for the overall master plan for Georgia's vocational educators.

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Insert Figure 5 about here.

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Insert Table 1 about here.

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Finally, the PLATO CMS is the focus of Risken and Webber (1974). Based on their experience in designing the CMS for the computer-based PLATO curriculum, they present a set of components for a curriculum and a set of criteria for an effective CMS. The curriculum components are

1. a set of lessons, each of which is a self-contained module of instruction
2. a structure that governs the order in which various concepts of curriculum ought to be presented
3. a set of entry rules that determine when each new part of the curriculum should begin and what materials should be employed. (p. 38)

Their criteria for an effective CMS are as follows:

1. independence from specific curricula or teaching strategies
2. adaptability to classroom practices of users
3. sufficient power to handle widely diverse kinds of curriculum structures

4. sensitivity to student preferences

5. sufficient power to schedule session times effectively

6. sufficient power to account properly for frequent curricular changes without disruption of student already working in curriculum. (p. 41)

## Discussion and Conclusions

The body of literature on curriculum management systems, as identified by this paper, is small and diverse. The range of citations include definitions of a CMS to descriptions of operational CMS models. The purposes of the curriculum management systems discussed included decision-making, curriculum devlopment and planning, and materials development.

Several conclusions about the process involved in this research seem warranted. First, despite the intent to include all the literature on curriculum management systems in the search, it may be that citations were excluded which may have been relevant. This could result from the initial use of abstracts to determine the relevance of citations to the question posed. Second, the arbitrary nature of determining at what point on the continuum of curriculum management systems/instructional management systems that a particular system was not relevant may have eliminated relevant articles. Perhaps, a research fallacy was committed in the assumption of the continuum in the first place. Third, the multiple potential definitions of curriculum or what is a curriculum perhaps should have been explored more extensively to determine a highly specific definition which would guide the selection of articles for inclusion.

The first conclusion is generally a hazard in conducting any "review of the literature" endeavor. It must stand as the one potential drawback of any further conclusions of this paper. The second and third conclusions, if accepted, may invalidate the entire intent of this paper and are discussed below, in light of the results of the literature analysis.

The CMS/IMS continuum appears to have been a valid assumption for this analysis. The articles discarded from the literature search invariably were of two kinds: discussions of systems approaches to educational management or articles on instructional management systems. In examining the twelve articles here, three were representative of the IMS tangent to the research. Further, if the

CMS focus is on the classroom instruction of students as in Henderson, Gebhart and Peter, and Risken and Webber, then it seems possible to conclude that these CMS models are hybrids or misnomers of an IMS model. This could occur from the arbitrary nature of placement on a continuum and from similarity of system components.

The curriculum definition probelm is explained by considering that the issue here was not curriculum per se but the management of curriculum. Further, both Risken and Webber (1974) and Proger (1977) present CMS as being non-specific as to curriculum. In fact, Proger proposed that there were two types of CMS; one which was curriculum free and one which was curriculum embedded. It could be argued that the more a management system is curriculum embedded, the more it becomes an instructional management system as opposed to a curriculum management system. This is due to the increased specificity which must occur as a management system approaches the level of the individual student. This specificity occurs as goal statements and management objectives begin to resemble performance objectives. In effect then, the more a management system is curriculum free or curriculum non-specific, the more the system will resemble a curriculum management system.

This, then, becomes the first criteria or definitional component of a comprehensive CMS model; that is that the CMS is curriculum free or non-specific to any type of curriculum. A CMS that is curriculum free can then be applied at all levels of the educational spectrum and can be used regardless of factual curriculum content.

An examination of the CMS models presented yields other general definitional components of a comprehensive CMS. Across these models, the components which occur most consistently are (1) needs assessment, (2) planning/development, (3) implementation, and (4) evaluation. Each of these is discussed in detail below. It is important to note here that the overall intent of the comprehensive CMS model is decision-making. Thus, the model also must generate information at each step of the system upon which to make decisions about curriculum. Additionally, the information should probably lend itself to the building of a computerized data base at the highest levels of educational administration. This is necessary for the potential volume of information that will be generated by a comprehensive CMS model.

Needs Assessment Stage

The needs assessment component is the initial information gathering stage of the system. In addition, it is the re-entry point for the reiteration of the CMS. That is, once the system is operating, information generated at other stages must be fed back to this stage to continue the process of curriculum management. Thus, all evaluative information is looped back to this point to reinitiate the decision-making process, which becomes a more, and perhaps better, informed process.

Two elements of information feed into the needs assessment stage: information from sources external to the educational institution and information from within the institution. External information will come generally from constituent advisory committees which reflect the population served and provide information on the priorities of that constituency. These advisory committees are likely to appear as citizen advisory committees, area business advisory committees, alumni advisory committees, and the like. Other external information may come from governmental sources indicating priorities of various agencies. Finally, external information will include demographic information on the area served. This information, upon analysis, should yield trends in population change, business requirements, community characteristics and needs, etc.

The internal information will include, but not be limited to, the following:

1. Current student population characteristics
2. Number and type of content areas available
3. Types of delivery systems used (includes technology-oriented delivery systems)
4. Allocation of human resources (e.g. number of teachers per content area)
5. Allocation of other resources (e.g. monies and technology per content area)
6. Evaluative information generated by the system (discussed under evaluation stage)
7. Inputs from internal curriculum committees.

After data collection from both information elements, a discrepancy analysis is performed. The results of this analysis then lead into the planning/development phase. In addition, these results feed back to the initial information if there is (a) no discrepancy or (b) insufficient information to conduct the discrepancy analysis. The flow-process diagram for the needs assessment stage is

found in Figure 6.

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Insert Figure 6 about here.

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Planning/Development Stage

The discrepancy analysis which leads into this stage provides information for two distinct elements. One element is a direct feed to the process of developing alternative strategies, a specific planning activity. The other element which uses the information is the curriculum development (CD) activity. In the CD activity, designing of the "ideal" or model curriculum occurs. This involves choosing content, assigning priorities to content areas, materials development (depending at which level of the education hierarchy the system is functioning), developing new content areas, and similar development activities. This activity feeds into the strategy development activities.

In strategy development, potential implementation strategies are examined including those whose purpose is the development of strategies to reconcile discrepancies between what is and what should be or what is desired. A primary activity in strategy development is the selection of delivery systems for implementation of the curriculum. This again is dependent upon the hierarchy level of the CMS, but even at the highest levels, suggested systems may be developed for choice at a lower level of the educational hierarchy. Delivery systems choice usually includes decisions on the allocation of resources. Finally, selection of the strategies for implementation occurs. Figure 7 graphically displays this stage.

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Insert Figure 7 about here.

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Care must be taken in the planning/development stage that curriculum decisions do not go beyond the bounds of the educational hierarchy level. For example, it is inappropriate for the curriculum decision-makers of the College of Arts and Sciences to determine the specific content of a particular

course. Rather, the college level decisions would only affect what general content areas to cover, i.e. what courses are appropriate to offer but not what topics are covered within those courses.

Implementation

This stage is the execution of the selected strategies chosen in the preceding stage. At one and the same time, this stage can tend to be the least complex because it involves merely executing the strategies chosen, and it can be the most complex, dependent upon the nature of the strategies selected for implementation. However, it must be noted that even as the implementation process is started, the evaluation process also begins. Thus, the implementation stage occurs simultaneously with the evaluation stage.

Evaluation

This stage is inherently the most complex. It involves assessment of implementation strategies and providing feedback to various portions of the previous stages, although the primary feedback loop occurs to the needs assessment stage. Evaluation is used in its broadest sense here, i.e. determining the success of the strategies implemented. Because of the different feedback loops, some evaluation activities are formative, looping back to various points in the previous stages to inform decision-making processes. Evaluation activities are also summative, often taking the form of program evaluation, to inform the needs assessment discrepancy analysis activities. This is done by providing much of the internal input information. Thus, evaluation information collected here can be quantitative as well as qualitative. Quantitative data include number of students in various portions of the curriculum, resources used (as compared to resources allocated), and the like. Qualitative data would include performance of students, performance of delivery systems (including performance of teachers), student satisfaction, and the like. Figure 8 presents a flow-process diagram for the evaluation stage.

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Insert Figure 8 about here.

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The Comprehensive CMS

Several assumptions must be made to enable this proposed system to be comprehensive. First, the system must be a continuous system. That is, the system reiteration is an on-going process. Additionally, the continuous nature of the system assumes that the system is operational at various levels in the educational hierarchy. In fact, as the application of the system moves closer to the level of student instruction, it should not be distinguishable from, or rather, becomes an instructional management system. In fact, at the instructional level, the planning/development stage should become an instructional systems development model.

While the CMS may be applied at various levels of the educational hierarchy, the system itself is non-hierarchical. That is, the various components of the system are in constant interaction and, while needs assessment may appear to be first, it may occur as the result of the implementation of a strategy first. Thus, the system is also non-linear with each component informing the other components and occuring simultaneously.

Finally, the system behaves in a stochastic fashion because of the non-linear relationships betwen components and the volitility of the external sources (i.e. society) which influence the system. Since educational institutions serve a constituient population, information and analysis of data tend to show trends as opposed to absolute answers. Further, the system must remain open to these inputs and will retain a certain lack of predictability because of this.

This system is intended as an appropriate management interface between strategic planning and instruction systems design/development. It is an idealized model which tries to account for the variablilty and volitility of the educational enterprise. Its applicability should be considered within this caveat. The CMS seems to be an appropriate response to today's changing society. In fact, it may now be operating in various forms with different names. Further research is required to determine viability of the proposed model and to determine, if it is now in operation, how valid the model is for curriculum management.

## NOTES

1. The research for this paper was supported by the Office of Curricular Affairs, St. Louis University School of Medicine and by the Center for Instructional Service and Research, Memphis State University.

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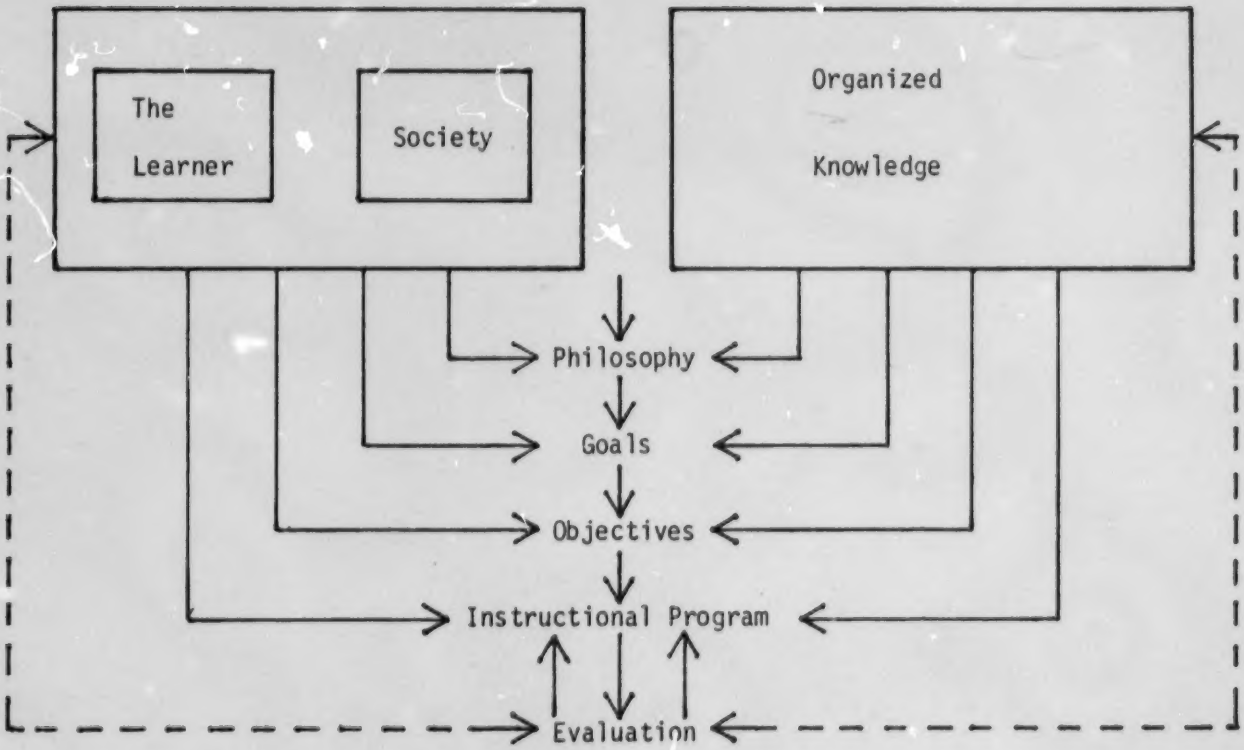


Figure 1. Gottesman's Conceptual Curriculum Network
(from Gottesman, 1976, p. 11)

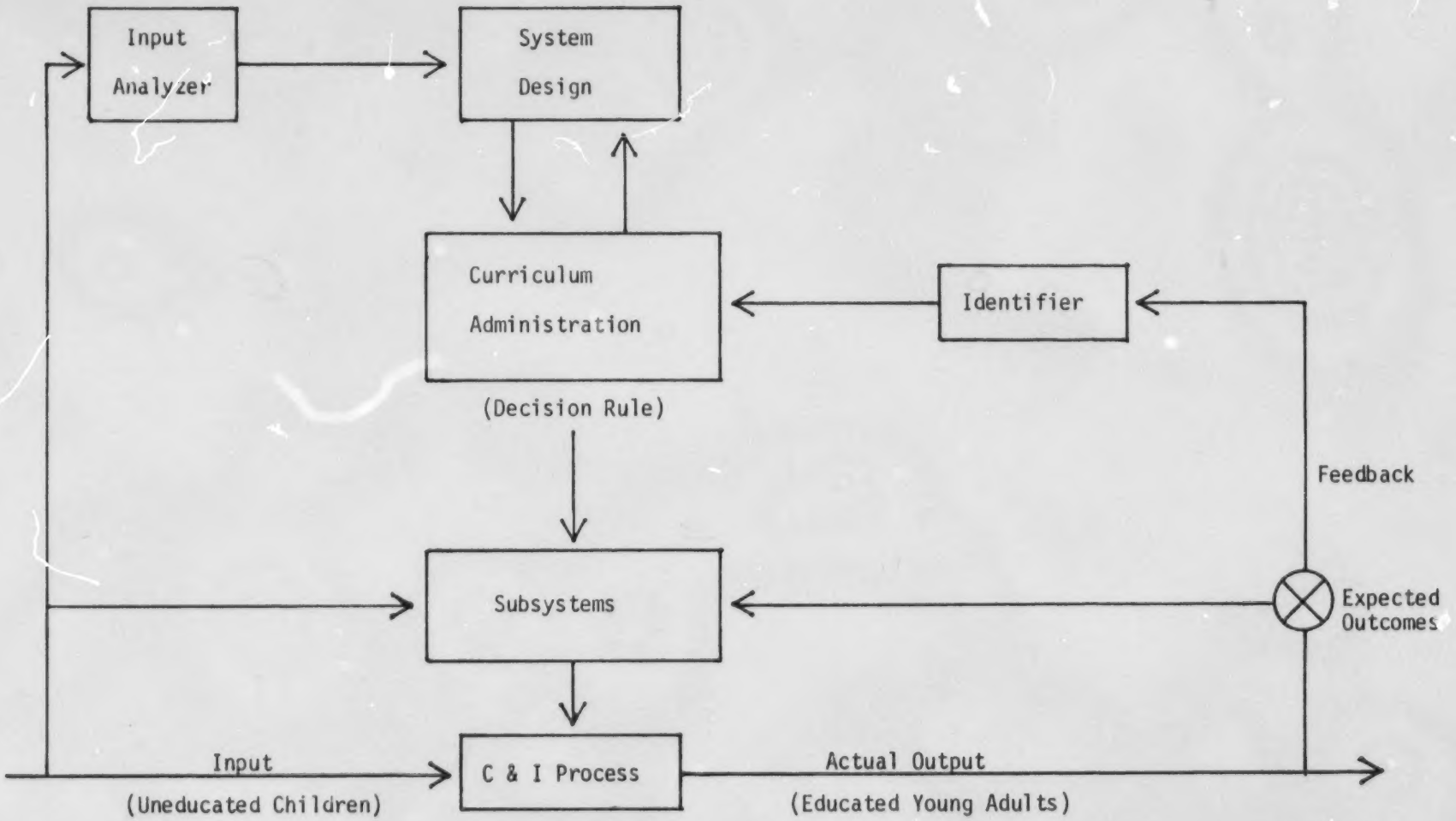


Figure 2. Feyereisen Curriculum Management System Model

(from Feyereisen et al., 1970, p. 59)

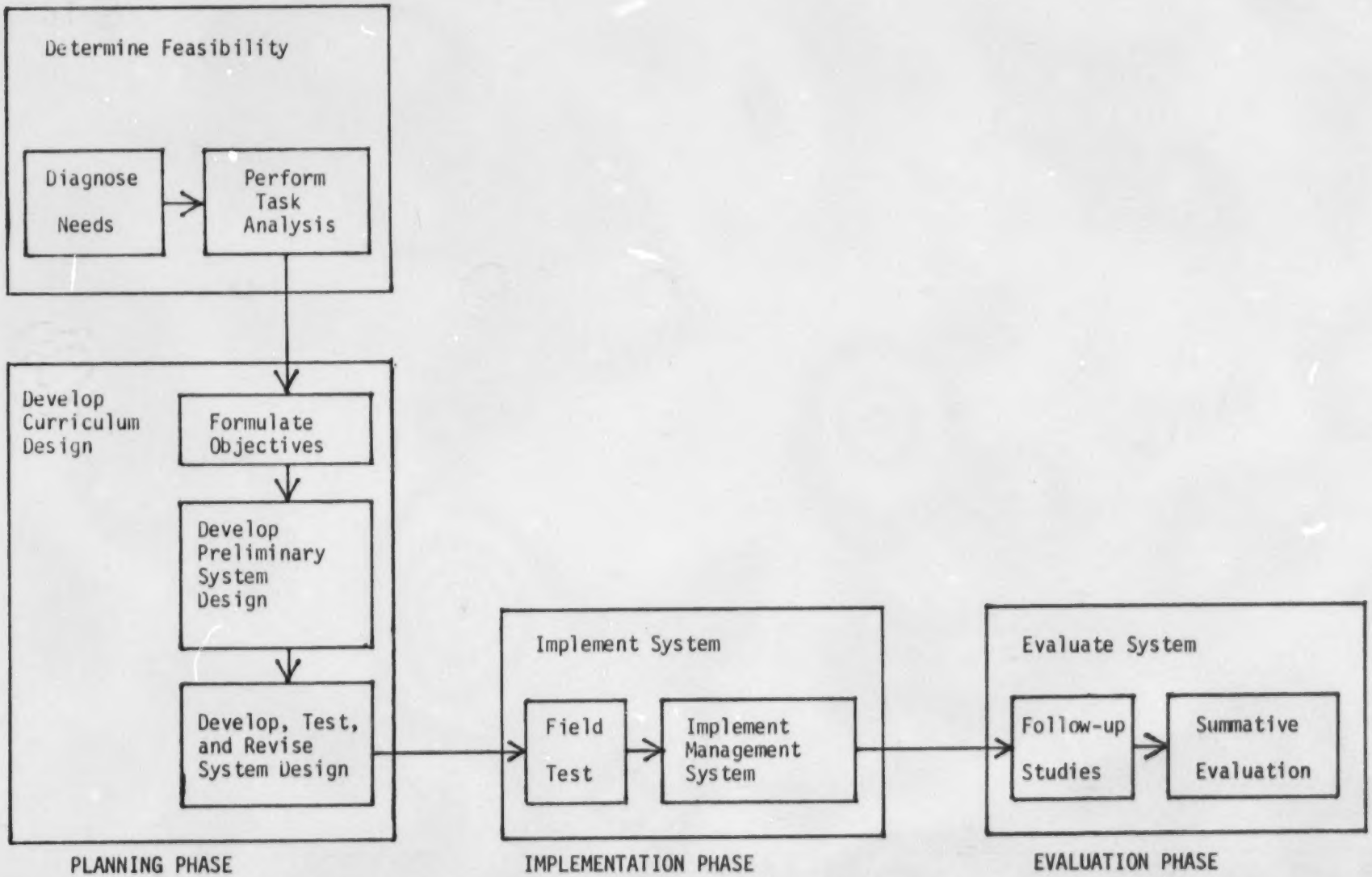


Figure 3. Valentine and Larson Curriculum Management System Model (from Valentine & Larson, 1979, p. 10)

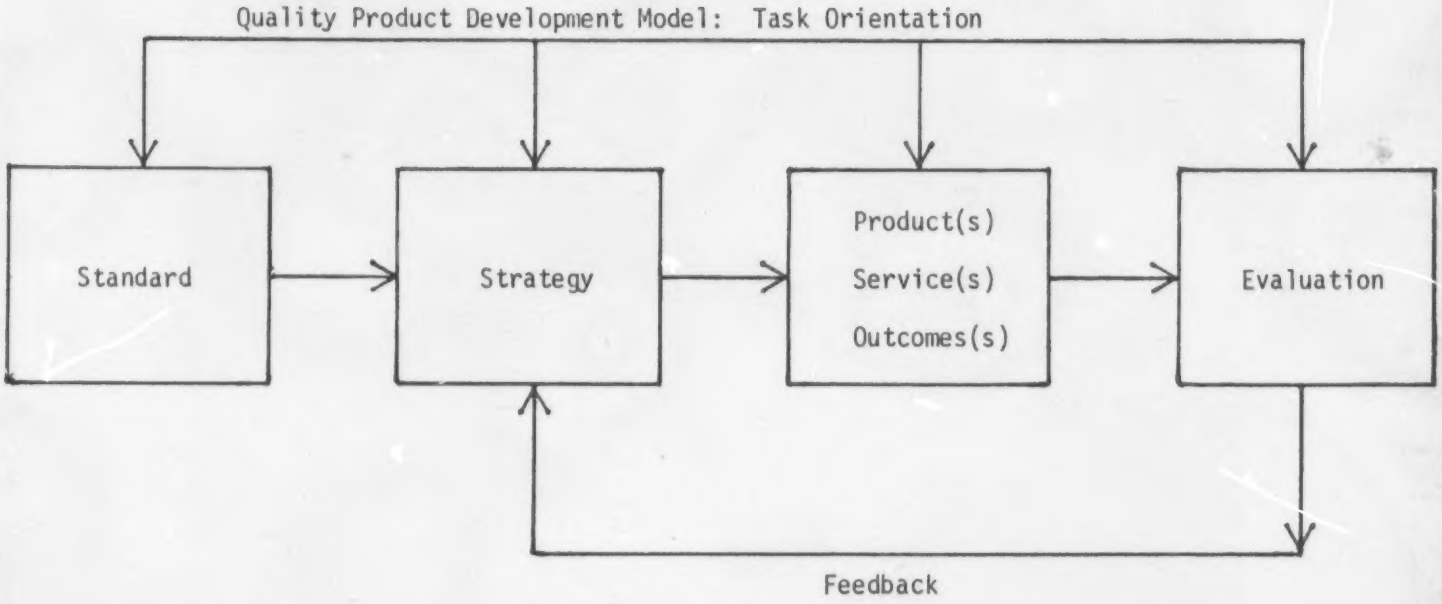


Figure 4. Project HIRE Curriculum Management System Model
(from Gardner and Beatty, 1979, p. 17)

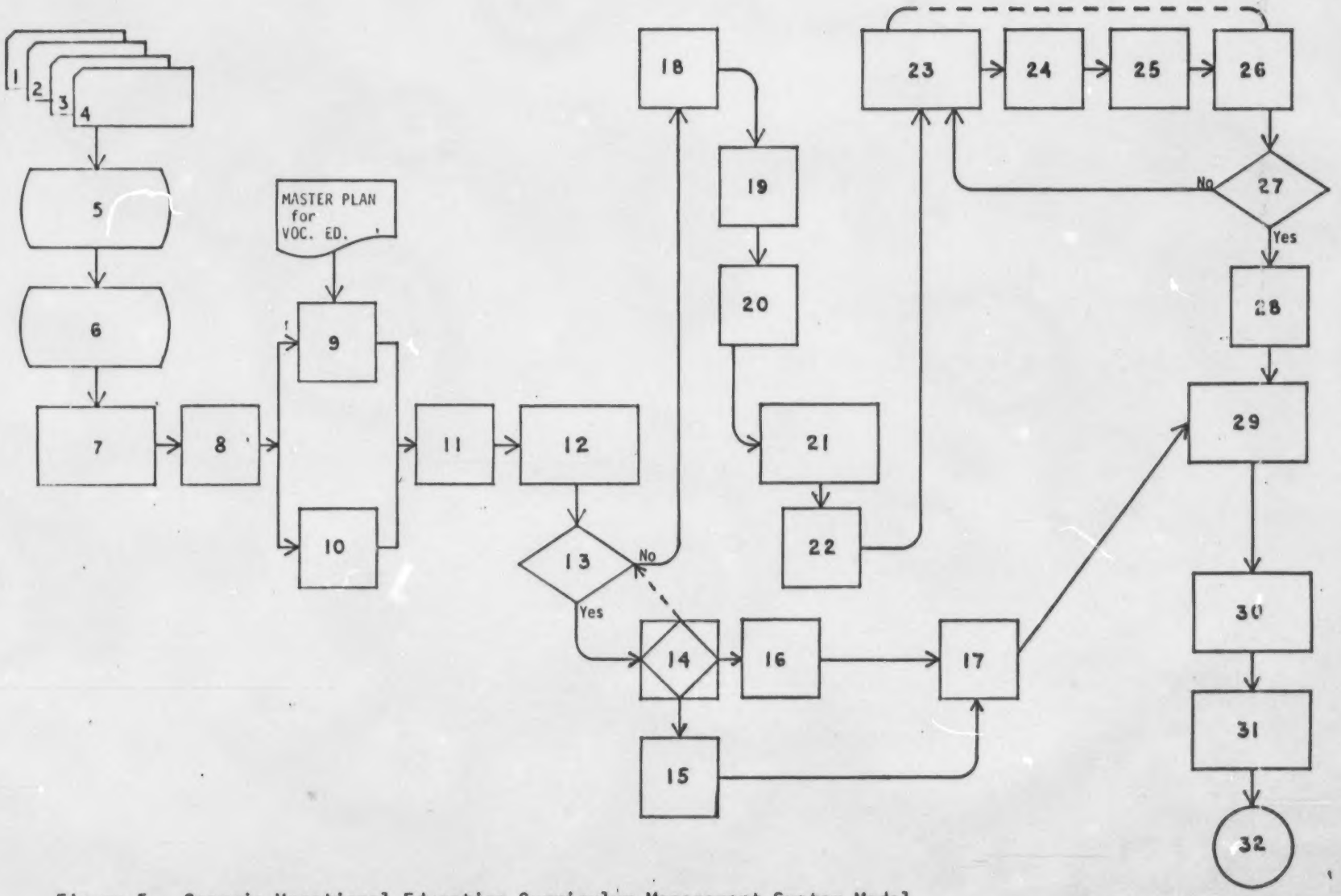


Figure 5. Georgia Vocational Education Curriculum Management System Model

(from Scott et al., 1979, pp. 16-20)

TABLE 1

Georgia Vocational Education Curriculum Management System Model:

Components and Elements

| Components | Flow Chart Reference Number | Elements |
|---|---|---|
| Input | 1. | Teacher Educators |
| | 2. | Local Vocational Educators |
| | 3. | OVE Staff (State Dept. Of Educ.) |
| | 4. | Business, Labor, and Industry |
| Organization | 5. | Instructional Area Curriculum Committees |
| | 6. | OVE Executive Staff (ultimate decision-making body) |
| | 7. | OVE Curriculum Staff (execution) |
| Needs Assessment | 8. | Needs assessment |
| | 9. | Identify program desired (based on voc. ed. master plan) |
| | 10. | Take inventory relative to plan |
| | 11. | Determine discrepancy between 9 and 10 and list needs |
| Materials Acquisition | 12. | Search for existing materials |
| | 13. | Decision: develop or procure |
| SUBROUTINE FOR PROCURING MATERIALS | 14. | Screening process for procured materials |
| | 15. | If ready to use the material, go to 17 |
| | 16. | Field test procured materials |
| | 17. | State editing of procured materials |

Table 1 (con't)

| Components | Flow Chart Reference Number | Elements |
|---|---|---|
| Materials Acquisition (con't) | 18. | List materials to be developed in priority order |
| | 19. | Assign funds and resources |
| | 20. | Prepare specifications and RFP's |
| Materials Development | 21. | Select appropriate developer |
| | 22. | Implement the development project |
| | 23. | Develop materials |
| | 24. | Face validate materials |
| | 25. | Pilot test |
| | 26. | Field test |
| | 27. | Does the product work (if not, recycle) |
| | 28. | State editing |
| | 29. | Have materials reproduced in quantity |
| | 30. | Diffuse materials including staff development and materials support plan |
| Evaluation/ Revision | 31. | Evaluation |
| | 32. | Revision |

from Scott, Simpson, and Butler (1979), pp. 17-19.

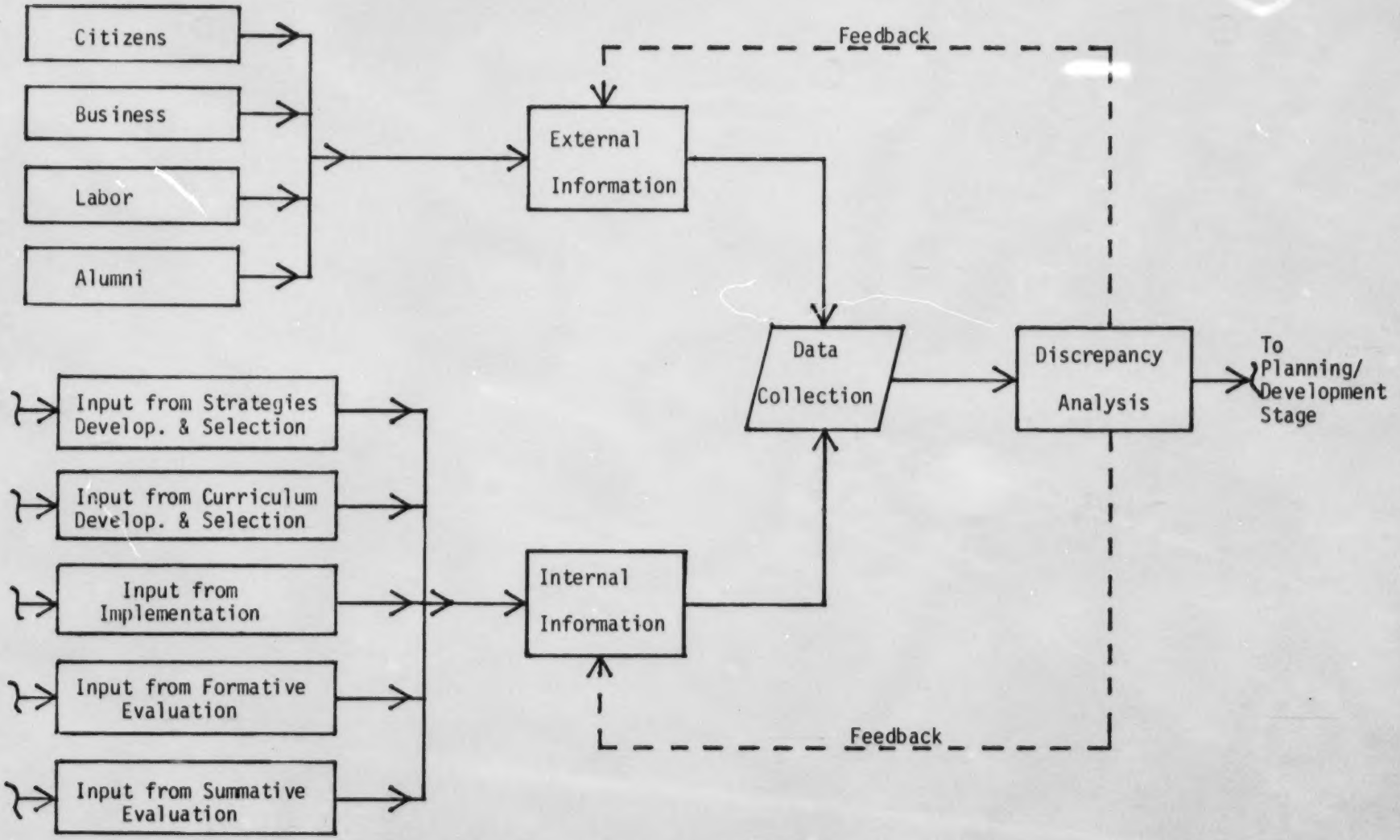


Figure 6. Ideal, Comprehensive Curriculum Management System: Needs Assessment Phase

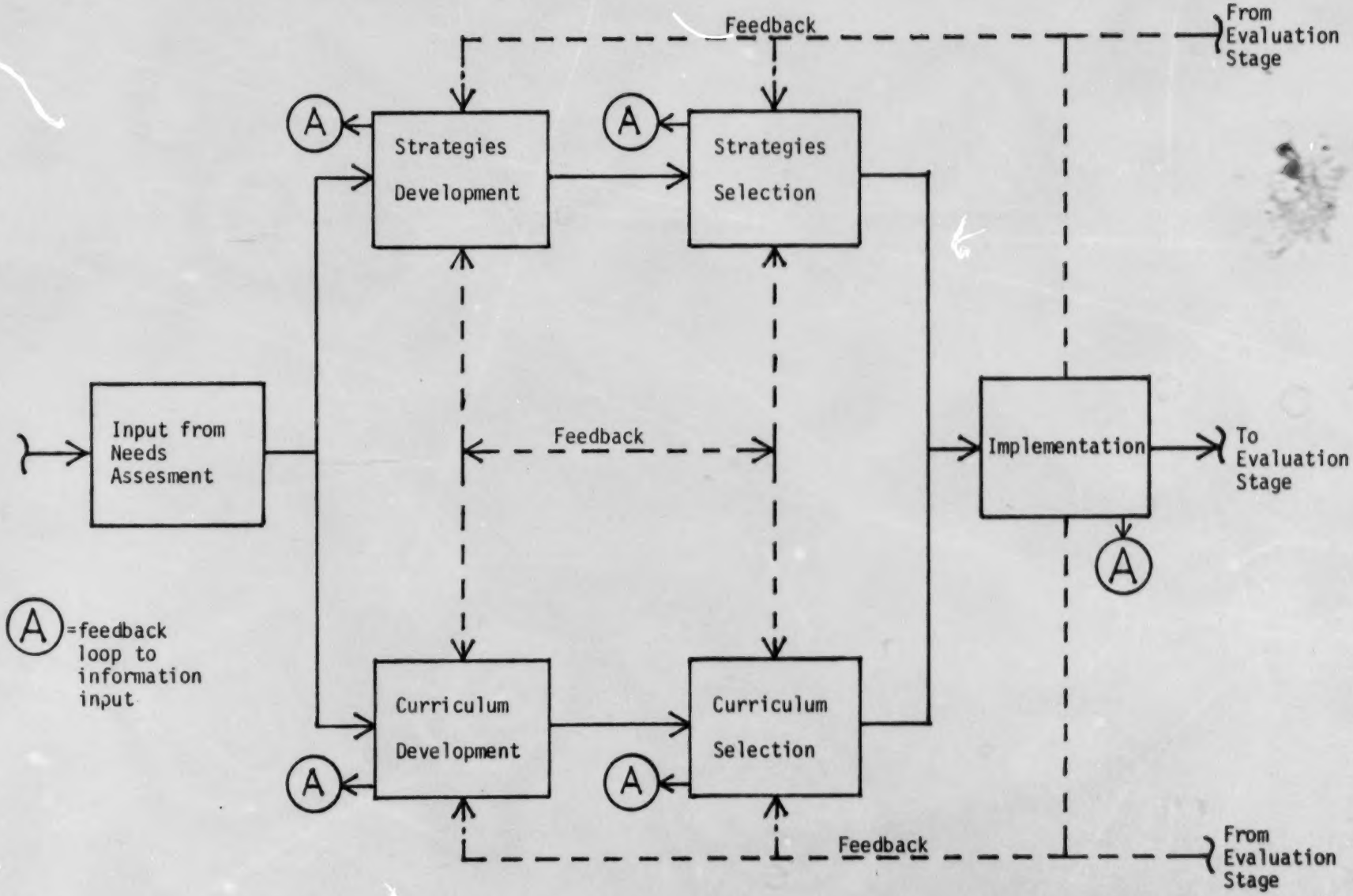


Figure 7. Ideal, Comprehensive Curriculum Management System Model: Planning/Development Stage

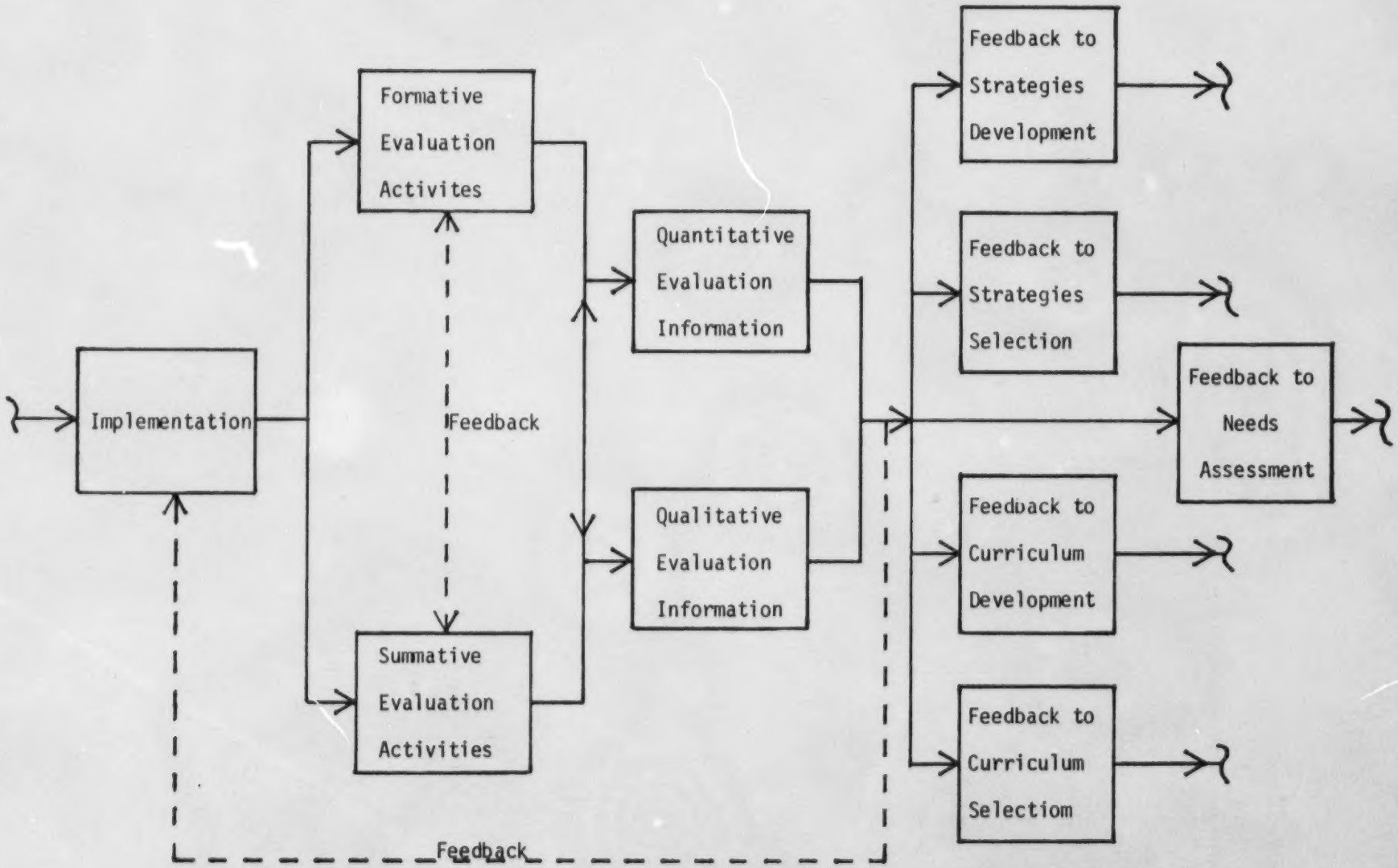




Figure 8. Ideal, Comprehensive Curriculum Management System: Evaluation Stage